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relation to the whole of natural phenomena: The definition of physical science here offered makes it the science of space detail. The hypothesis that every phenomenon describable in physical terms is incapable of explanation in such terms is a meaningless hypothesis; but we need not conclude from this that the physical is the only science. The physical details of nature may perfectly well be grouped in classes that are incapable of physical definition; for objects thus described non-physical laws may be developed. The same object, therefore, may be capable of a double description. Any given human body, *e. g.*, is made up of particles whose only description is physical. As so described its behavior as a whole is the resultant of the behavior of its parts, and is susceptible of physical explanation. This same human body is capable of classification with other human bodies, animal bodies, organisms, etc., whose common element is not physical. As so grouped its behavior is not physically described, and so can not be physically explained. Yet this fact represents nothing indeterminate in the physical world-order.

EDGAR A. SINGER, JR.
UNIVERSITY OF PENNSYLVANIA.

THE MEANING OF ANALYSIS

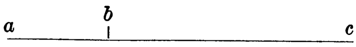
I SUGGEST that before we proceed to analysis in psychology we obtain a clear idea of what we mean by analysis. A definite fixing of a meaning may at first seem hampering and ideas of course run into one another, but in the long run we shall gain by a more accurate cutting of our words.

I shall consider it advantageous and not a confusion of spheres nor an unlawful transferring of analogies, if we can give definiteness by the use of visual forms. Such visualizations help us to mutual understanding more than word definitions, provided we are careful to remember that these forms are mere forms, have no control over experience and are to be used only in so far as experience fits into them.

I. THE VISUALIZATION OF DIVISION

The word analysis, as popularly used, is identical with division or separation, or in its simplest form with subtraction. Its usual visualization in this sense is a group of points or, when the points are arranged for easier manipulation, the visualization is the line divided into parts, *ac,* divided by *b* into *ab* and *bc*:

FIGURE 1.



With this view a number is thought of as an aggregation of units. There is nothing in this form to show that the parts are in any necessary relation to one another. They are as able to stand by themselves as in the whole, and there even creeps in the implication that the whole is merely the sum of the parts; *ac* becomes a mere name. Therefore the parts seem more real in contrast with the artificial wholes. The result of applying this mathematical form to experience is pluralism, atomism, Monadology, etc.

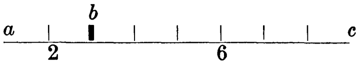
How then, it may be asked, have we the current 'monistic' systems obtained by this form of analysis? The reply is that the current idealistic and 'scientific' monisms are monistic only in contrast with the dualism of subject and object, which was reached by this same divisional analysis. Although the unabridgeable parallelism of the subjective and objective is overcome by regarding the one or the other as phenomenal, yet both idealism and materialism are ultimately pluralistic and not monistic. The fact of memory seems to save idealism from being pluralistic, but this is a position reached independently of, we may say, in spite of the conclusions of analysis.

The application of this divisional formula to the experience of space gives the corresponding view that space is made up of an infinite number of real points.

II. Analysis into Coordinates

There is, however, another mathematical visualization which, although including division and subtraction, does not lead to the scatteredness and disintegration that result from the method of division. This is analysis into *x* and *y* coordinates; and it is this geometrical meaning of analysis which I believe it would be of advantage to hold to strictly when the word is used in psychology or in experience anywhere. As has been said, if we wish to divide 8 into two parts, say 2 and 6, which make it up, we can make a picture of a line *ac* and divide it at *b* into *ab* and *bc*.

FIGURE 2.

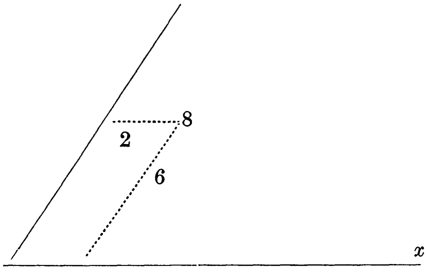


In this picture the fact that the two parts are necessarily parts of the whole 8 does not appear. They are perfectly able to stand by themselves and the 8 has been lost.

I understand an analysis to differ from a simple division, in that the mutual relation of the parts to the whole is not lost. The integrity of the whole is retained. In mathematics, the analysis of 8 into the two parts 2 and 6 may be illustrated by regarding the 8 as a whole made up of two coordinates (Fig. 3) which have a meaning only because they together make up the 8.

In this visualization the 8 is defined by its relation to two axes, x and y. Their purpose is to afford a fixed standard by relation to which any point may be defined with regard to other points, therefore the angle between them is for the purpose of illustration, a matter of indifference.

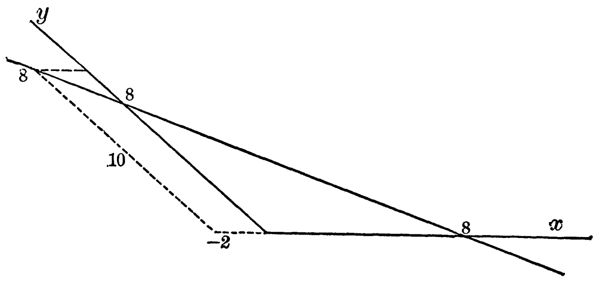
FIGURE 3.



If we wish to express the more general analysis of 8 before we have determined the values of 2 and 6, we shall have the general equation $8 = x + y$, or the equation of the straight line which cuts the x and y axes at the distance of 8 from the intersection. At every point, however, the 8 stands for itself and is not made up out of the parts.

With this process in mind, we shall picture a number not as a group of points nor as a series of points laid off upon a line, but the picture of 8 will be the line cutting the x and y axes at 8 (Fig. 4).

FIGURE 4.



Such a line represents the full content of 8 and moreover shows its relation to all numbers, for by extending the x axis in the minus direction we have $8 = 10 - 2$, etc.

Now turning back to the more customary and perhaps genetically the more original picture for representing a number divided into its parts, namely a straight line (Fig. 2), we shall see that it serves its purpose as well as it does because it is a particular form of the more general picture which we have given above. In this particular form, the x and y axes have been made to diverge more and more until finally the y axis has become a continuation of the x axis (Fig. 2). We still have $8 = 2 + 6$, but the coordinates are identical with the axes, thus assuming a fundamental character and moreover they coincide with the line of eight which thus, instead of preserving its intactness, is lost and seems to be made up of the parts.

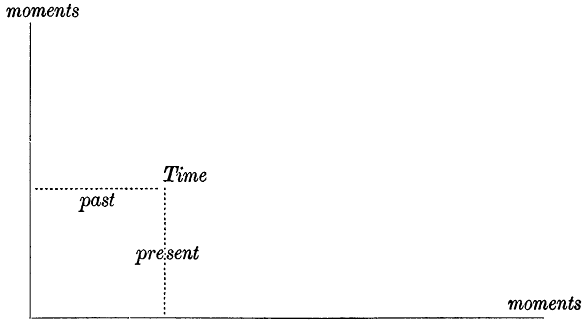
It is the purpose of this paper, therefore, not so much to controvert the popular conception of analysis as to broaden it and to give to analysis its full content and meaning. In this interpretation of analysis, then, I would call attention to the following points:

1. The initial whole is never lost. The 8 retains its integrity and yet full justice is done to the parts 2 and 6, which in turn may be similarly analyzed.

Those who have attempted to reach a conception of unity through the method of division will appreciate a method of conception which never loses the initial unity.

If we are analyzing time, it is very often important to remember that time, though made up of moments, is still a whole; as is adequately represented in Fig. 5.

FIGURE 5.



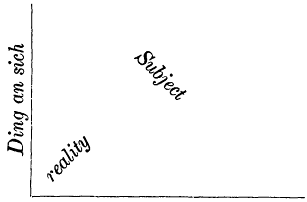
2. In this conception of analysis, the 6 has a meaning only together with the 2 in making up the 8. The 6 is real, likewise the 2, but only in reference to each other and the 8. (The fact that they are abstractions from the concrete 8 does not affect their reality. The word abstraction is not to be used as a contrast to reality.)

If we keep this picture carefully in mind we shall not be in danger of neglecting a part, in conjunction with which alone the other part or element has a meaning. As for instance some psychologies do, which out of an analysis of consciousness find the will as an element, and then a few pages later we find this will grown quite independent and walking about by itself as an unconscious will or a subconscious will.

The 6, if derived from the 8, has a meaning only together with the 2 and with reference to the 8.

3. If we keep before our eyes this visualization of the process of analysis, we shall not attach any importance to a word which originated as a factor in an analysis, but which is continued after the corresponding factor, with which alone it has a meaning, has been rejected. We have not the right to keep on employing an analysis after we have rejected one of the legs.

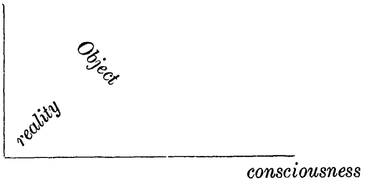
FIGURE 6.



The importance of this point may be illustrated by the *Ding an sich* or object which the idealist rejects as an unreal abstraction but continues to retain the subject. He lets the subject factor encroach more and more over the object side till the object is reduced to 0.

It is further illustrated by the consciousness which the materialist would reject as an ureal abstraction, letting the object encroach on the subject.

FIGURE 7.



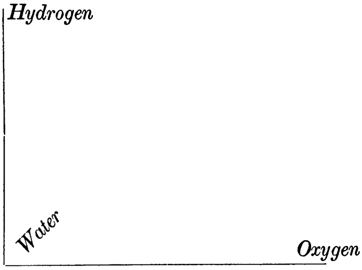
With the divisional conception of analysis the zero can be neglected; with our conception, as shown in Figs. 6 and 7, it can not, for zero is a limit approached but never reached.

A somewhat similar overlooking of essential correlatives is the fault of the sensationalists from Condillac down to Mach. They analyze experience into perceptions of things, and then perceptions of things into sensations and call the last the ultimate. In each step one of the legs of the analysis has been neglected. They might just as well go on and as a next step analyze, with the materialists, sensations into wave motions, for in this step they would neglect no more important factor than they already have in reaching sensations by analysis as simple elements.

4. This form of analysis with its x and y coordinates has the advantage of serving as a framework when we have not yet determined the value of the constituent elements; for instance, in an analysis of water.

Such diagrams do not explain anything. They do not solve the problem of the like and unlike or of unity and plurality. They rather dissipate the problems. They give a picture making graspable what might otherwise present unsurmountable difficulties to our thinking and enable us to proceed.

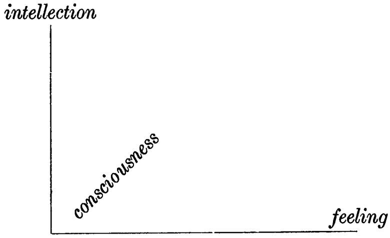
FIGURE 8.



5. This framework makes possible an analysis in which the parts are dependent yet variable.

In consciousness, for instance, feeling and intellection are independent variables, yet there is no feeling without intellection and no intellection without feeling, all of which is represented in the above figure. The word feeling extends clear across, approaching zero at the line of intellection. Just as, in Fig. 3, by varying the scale and the proportion of the parts any point in the plan may be regarded as 8, so here in Fig. 9 the general form is to regard the whole plane as representing consciousness till a unit has been determined for the analysis.

FIGURE 9.

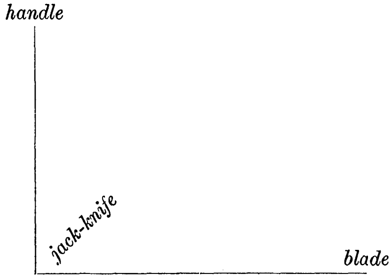


6. The word synthesis is given its true meaning in relation to analysis. Every analysis contains in itself a synthesis.

The following may elucidate the general position (Fig. 10). In case we are analyzing a jack-knife, the handle is not a handle save in respect to the blade, and both have meanings only in respect to the whole.

Both the handle and the blade are abstractions. Independently of its relation to the jack-knife, the handle as a different fact of experience may be considered also as composed of horn and brass, and the blade may be also a part of pig iron, and so on.

FIGURE 10.



As has been said, the fact that a thing is an abstraction does not affect its reality in the sense in which we are using the two words. The counterpart to the abstract is the concrete and not the real.

III. APPLICATION OF THIS MEANING OF ANALYSIS

I feel justified in maintaining that this mathematical form of analysis which preserves the relation of the parts to the whole and the integrity of the whole is more applicable to the facts of experience and less open to contradictions than the form of simple division which is often called analysis and that moreover the distinction is important enough to be worth insisting upon.

1. In the first place it corresponds to and fully represents our experience of space. Space as experienced is not abstract nor an abstraction, nor is it a composition, but as a whole it is a concrete in comparison with which the particular parts are abstract. I use concrete as meaning more immediate and the word abstract as more derived. A particular line or square before me is not more concrete but rather more abstract than the experience of space as space. In such cases we must not compare this particular square before me with remembered space or conception-space, but realize that it is only a part of or an abstraction from present experienced concrete space.

2. In the second place, it more truly represents the analysis of chemistry. We will dwell a little upon this point because chemical analyses might, perhaps, be brought forward as contradicting the meaning of analysis which we are trying to establish. For most purposes in chemistry it is sufficient, using the idea of division, to

regard O and H as independent atoms, containing in themselves at least potentially all the characteristics which produce water. When, however, the chemist wishes to avoid metaphysics, he must remember that hydrogen is, only in its relation to other similarly derived atoms. Compare Fig. 8. So H and O have a meaning only in their mutual relation, and in all their relations as parts of all the substances into which they enter. When we think of H, the O seems to be entirely gone, but this is only a seeming, for an inalienable part of the reality of H is its relation to O and the whole reality of H is its relation to all other elements. This fact our picture of analysis prevents us from overlooking.

3. The importance and truth of this meaning of analysis and its wide applicability to experience is illustrated in the third place by the parallelograms of forces in mechanics, which I think we have a right to regard as a development of this form of analysis.

To analyze the force 5, we must use the square of 5, because the force varies as the square of the distance. Figs. 11 and 12.

FIGURE 11.

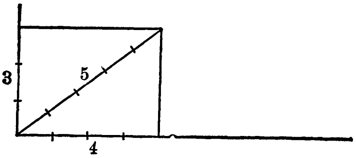
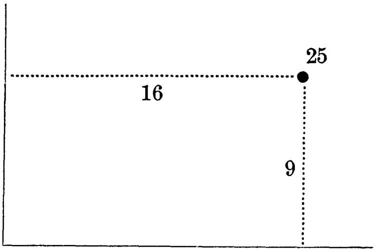


FIGURE 12.



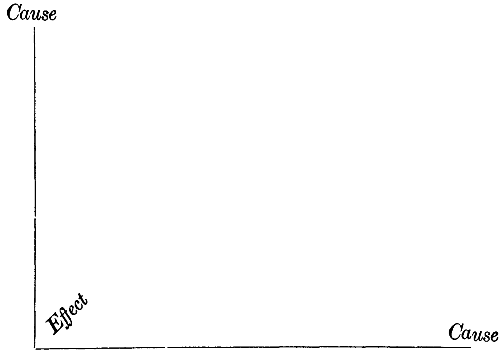
The square of 5 is 25, which, analyzed, gives 9 and 16 or 3 and 4, for the component forces. The complete analysis of the force 5 would be represented by the line of 25.

4. In the fourth place the universality of this conception of analysis is evidenced by its applicability in physics to illustrate the analysis of an effect into its causes, Fig. 13.

An effect is therefore a substance, as water is, which we analyze into its elements. This is more than a mere convenience, bringing chemistry into line with cause-effect relations; it becomes an indispensable form when we come to combat the idea that it is the law which produces the effect. The law is merely the result of the analysis of the effect. The law of causation is not a *vis a tergo*. It never pushes into the future.

It is misleading to take the cause which is chronologically prior as the logically prior. Logically the cause is the result of analyzing the effect. From the standpoint of science it is the possibility of analyzing out the cause of an effect which keeps the relation between the two from being a mere sequence like that of day and night. In the difference between the relation of day to night and that of an effect to its cause, we have a good example of the difference between a division and a proper analysis. Höffding calls the former the empirical conception of causality and the latter the ideal conception ('Philosophische Probleme,' p. 17).

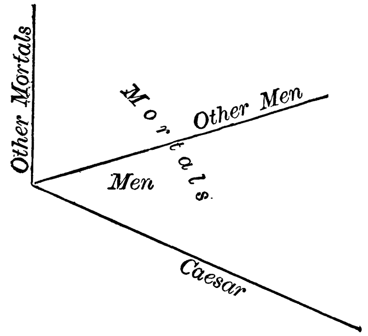
FIGURE 13.



5. In the fifth place as a justification for this conception of analysis I would point out that this form alone adequately represents analysis in logic.

In Fig. 14 the concept mortals is analyzed into men and other mortals; and then as a second analysis the concept men is analyzed into Cæsar and other men, giving the conclusion Cæsar is a mortal. By regarding the minus side as negative, all the syllogistic forms can be readily illustrated. The diagram can apply to the intension as well as the extension of terms.

FIGURE 14.



A logical proposition then is one leg of an analysis, the other leg of which is implied, the triad thus forming the epistemological unit. Logical analysis falls into line with chemistry and mathematics, and this through no forcing of an analogy, but through the use of a single mathematical form to make graspable a great variety of experiences. This interpretation of logic is not to be confused with the realism of the schoolmen. The general term is not more real than the particular, but it is more concrete. The greater concreteness or immediateness which the particular term like Cæsar seems to have is due to the many other relations which it has. In comparison simply with the term men, however, it is more abstract or derived.

6. Finally this meaning is of importance in psychology where we must insist upon 'consciousness,' or 'the Given,' or 'experience' as the primary concrete of which all the so-called elements are in comparison abstractions. That is to say compared with this primary concrete, the subject and object, the ego and the non-ego, the I and the it, the will, the feeling and the intellect are abstractions derived by the process of analysis. This primary concrete (the 'social-consciousness,' 'pure experience,' the 'absolute') is not a deduction nor an induction, nor a composition, nor an hypothesis; it is the point of departure.

After we have determined upon a meaning for analysis we shall be ready to proceed to the use of analysis in psychology and, if consciousness be the best point of departure, to an analysis of consciousness.

GEORGE R. MONTGOMERY.

CARLETON COLLEGE.

DISCUSSION

RELATIVITY AND REALITY

THERE is of course a connection between the recent discussion of relativity or phenomenality and the efforts to define infinity. This connection, too, has been frequently felt and almost as frequently directly avowed by those who have been parties to the different controversies. Simply the antithesis of the real and the relative, and the antithesis of the infinite and the finite present essentially the same fundamental problem to the philosopher. In this paper, or rather in this brief note, only the former of the two antitheses is the object of direct interest; but at the close a suggestion or two will be ventured in regard to the latter.

Even at the present time, and also even among the more prominent thinkers of the present time, the idea that the relative and the real must somehow exclude each other is very much in vogue. True, an adequate philosophy of evolution may seem to demand their